Development of Bluebeam Curriculum for Construction Management Department in Virtual and In-Class Transmissions

Jacob Clark
California Polytechnic University
San Luis Obispo, CA

This paper discusses the development of two new learning modules for the California Polytechnic University, San Luis Obispo Construction Management department on Bluebeam practices and usage that reflect industry and technological changes. Adapting to and maintaining practices in distance learning, this curriculum allows for optimal online education and further advancement and clarity in in-person transmissions. With step-by-step videos for optional distance learning, students and faculty can choose to engage in alternative modes of education delivery. Building on traditional roles of construction technology education, teaching instructions are provided for faculty. This project based senior project positively impacts the body of knowledge available to students and faculty at Cal Poly in relations to construction technology.

Keywords: BIM Education, Virtual Curriculum, Construction Management, Bluebeam, Online Education

Introduction

Seeking to create a new Bluebeam module for the Building Information modeling (CM 280) course as well as one additional module to be used as an intro assignment in two other courses, Residential Construction (CM 214) and Construction Management and Project Planning (CM 371). Development of virtual distance learning video for CM 280 module in tandem to allow in class notes and teaching preparation for support courses. Bluebeam is a fundamental pdf management tool used in the industry, and it is important for students to understand how and when it can be used. The current assignment in CM 280 is outdated and needs an immediate update to stay current with industry trends. This tool is also used in several other courses, including CM 214 and CM 371 but there is no intro module or walkthrough demonstration offered in support. After teaching as an Instructional Student Assistant (ISA) over the last several Cal Poly academic quarters, engaging with old curriculum, and navigating industry experiences in internships, the Bluebeam instruction

Drawing on previous video creations in the spring of 2020 and prior teaching experience as an ISA, this senior project is the capstone of teaching, internship experience, and faculty support during my time at Cal Poly. Fulfilling the knowledge gap and classroom challenges, these project deliverables bring Cal Poly students, faculty, and staff the ability to learn an important construction technology software.

PROJECT STEPS

Introductory Research

Introductory research of the project began with an initial inquiry from Cal Poly faculty Andrew Kline and Jeong Woo over the impact of the Bluebeam curriculum. As faculty leaders of the CM 280 course, BIM, and BIM ASC competition team, they help manage and support construction management technology material being presented to Cal Poly students. After initial inquiry to the development of virtual curriculum to aid students in distance learning, I reviewed viable options for filming, editing, and publishing virtual learning modules. Soon, I selected Camtasia software version 2021 to record and edit videos for publishing. Once selected, I spoke again with Andrew Kline about the section's needed material and created a list of topics in the video. For the additional estimating module, I spoke with Professor Eric Brinkman about course needs in CM 214, Residential Construction. Gaining input from professor Brinkman and selected students in his afternoon course proved valuable for understanding the needs of the course and how a distance module would best serve students. Furthermore, the idea list was final refinement and selection in the curriculum staging step of process.

II. Curriculum Staging

After initial interviews, questioning, and idea creation, final refinement of ideas and rubrics were assembled. To begin, I wrote down key parts, assemblies, and tools that needed to place in the course. These were arranged in the student assignment instructions and rubric in brief detail of each task. As shown below in this paper under project photos *figure 5.4*, you can see the assignment instructions highlighting that each task that will be performed and graded during the module. Construction documents were pulled from ASC competition documents provided by Morley builders in Mixed Use competition 2021 for the CM 280 module. For the estimating assignment, construction drawings were provided by Eric Brinkman from Cal Poly course CM 214. In the creation of assignment sheets for both modules, it paved the way for ultimate production of video curriculum and subsequent teaching guides.

III. Curriculum Production

Production of videos and final deliverables commenced with the creation of the video modules. After the key elements of assignment sheets, drawings, and rubrics were developed, video production began. With a quiet studio, camera, and headphones, production began on the modules with the support of Camtasia software. Utilizing the screen sharing ability, I was able to give step-by-step instructions of the assignment whilst sharing the screen on how to navigate. Following multiple video takes, breaks, and runs, the final video was complete and ready for editing. I added a project introduction, contact information and key markers along the way to help students with the project. Editing took considerable time in the project and meticulous analysis of phrases throughout the video. Finally wrapped up with the main project deliverables. Moreover, I summarized the main teaching points in the teaching guide as shown in project photos *Figure 5.3*. This teaching guide serves as a support document for faculty looking to teach the course in person rather than video format. It highlights all the key steps in the video and provides step-by-step instructions.

IV. Project Packaging

The ultimate users of this project are both the Cal Poly faculty and staff who will be implementing the curriculum. Utilizing OneDrive ZIP files, project deliverables mentioned below were shared with Cal Poly faculty Andrew Kline, Jeong Woo, and Eric Brinkman for dispersal in related courses. Additionally, all deliverables were provided in final and editable format for easy refinement and rubric update for point adjustments. The final graphic below (*Figure* 2.1) highlights key elements of each project step.

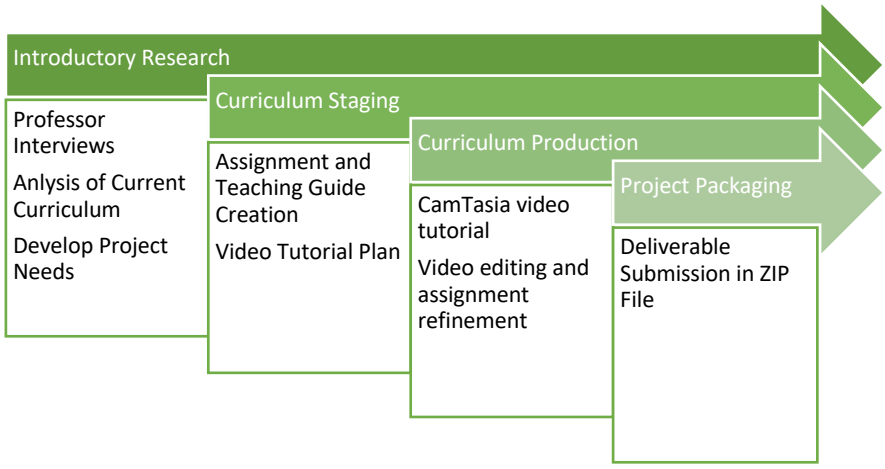


Figure 2. 1

Deliverables

Project deliverables include separate submissions for each set of curricula created. Shown below in *Figure 3.1* below, the CM 280 Bluebeam Module and Bluebeam Estimating Assignment each have final products of video tutorials, assignment covers sheets and rubrics, and a teaching guide. These deliverables provide Cal Poly faculty and staff with all the necessary tools and information to effectively teach students the basics of Bluebeam technology. With the addition of quiz questions for the CM 280 course, all deliverables will be shared via ZIP file to stakeholders aforementioned in the project steps.

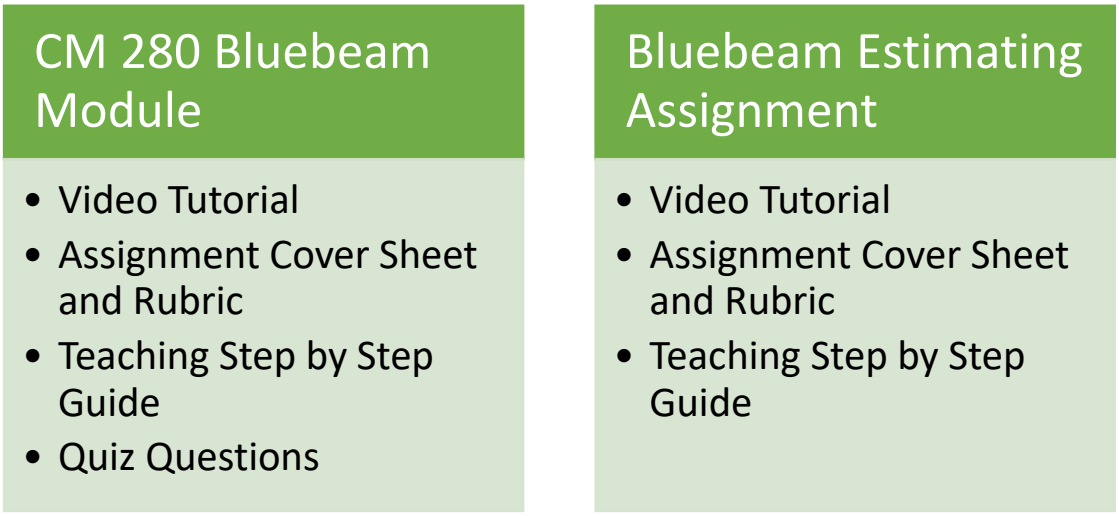


Figure 3. 1

Lessons Learned

Throughout the staging, development, and submission of course curriculum, I had to navigate new areas of learning unexperienced by myself. With interest in teaching in the future, it was incredibly beneficial to learn the skill of project planning, assignment structure, and curriculum development. Having to create, execute, and deliver meaningful course material took more planning, creativity, and support then I originally anticipated. With firsthand experience, I feel more prepared and confident in overall academic course material creation and execution. In addition to teaching learning opportunities, this project further advanced my video creation and editing skills as well as public speaking, and online learning. Being in front and behind the camera forced me to learn new skills in editing as well as making material available for online transmission. I am thankful for this project enabling me to learn and grow in these areas as online content will grow more valuable as we continue to rely on internet information. Summarized in the chart below, here are the 6 elements heavily reinforced and developed alongside this project.

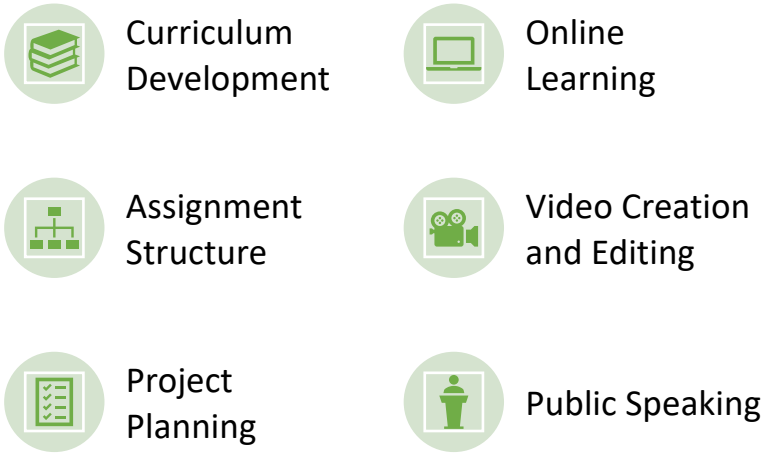


Figure 4. 1

Project Photos

Showcasing key steps, deliverables, and submissions for the project, these photos give a brief glimpse into the creation and final product of curriculum material.

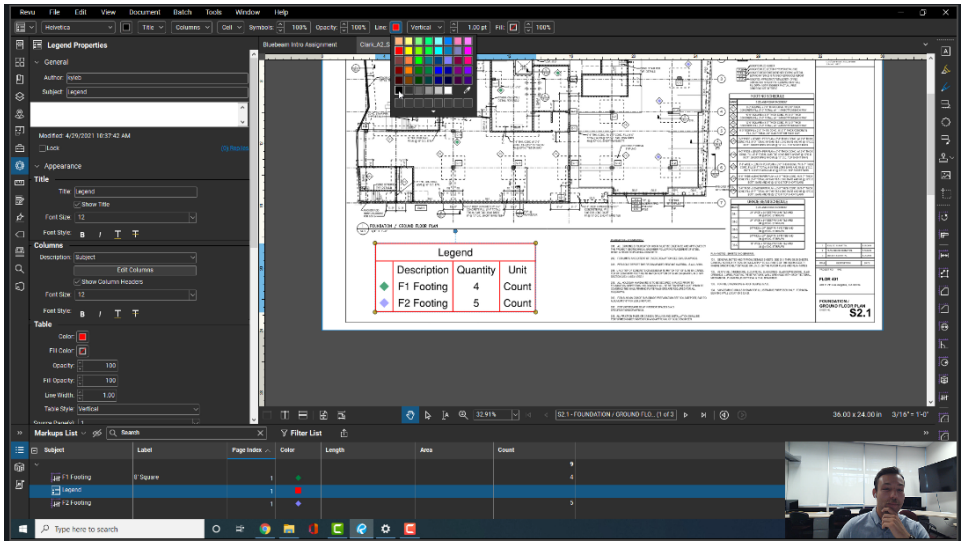


Figure 5. 1

Figure 5.1 shows a screenshot of the final product video for the CM 280 course. The video shows the Bluebeam interface as well as Jacob Clark in the bottom right corner with voice over instructions. Students will experience and interact with the assignment through this view.

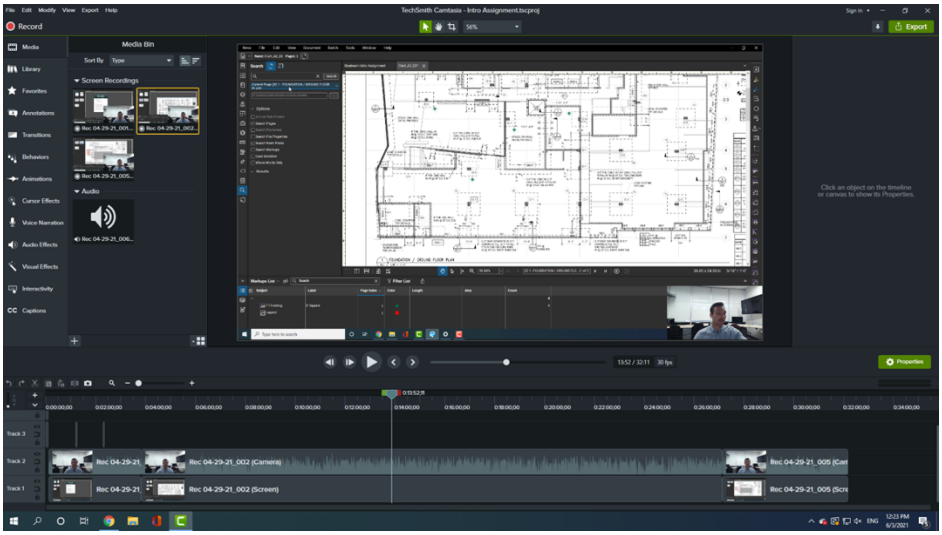
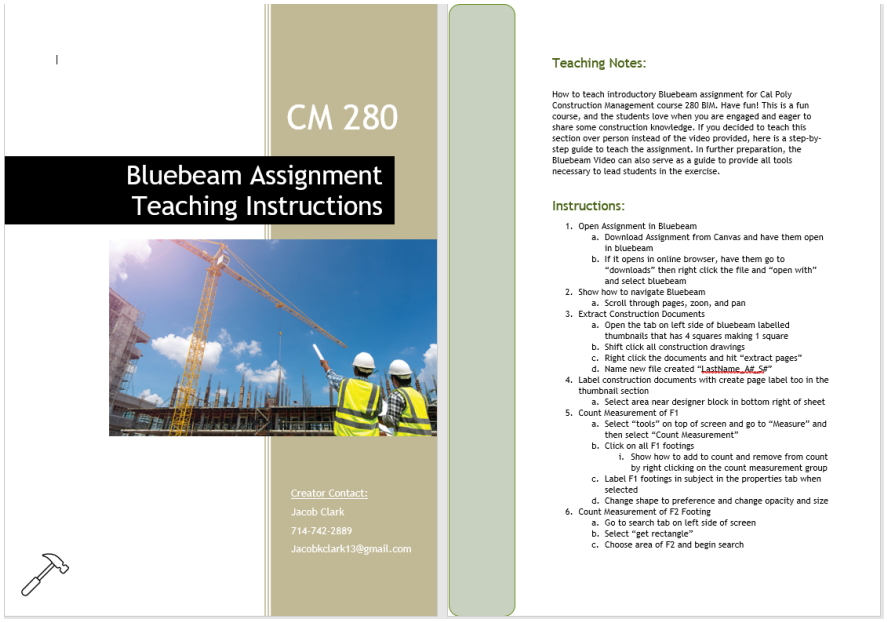


Figure 5. 2

Figure 5.2 shows the editing and video recording technology Camtasia. This software proved valuable to record and edit material for final submission. With the ability to add multiple recordings, markups, and commentary, this helped make the videos useful for students.



CM 280

Bluebeam Assignment
Teaching Instructions

Creator Contact:
Jacob Clark
714-742-2889
Jacobkclark13@gmail.com

Teaching Notes:

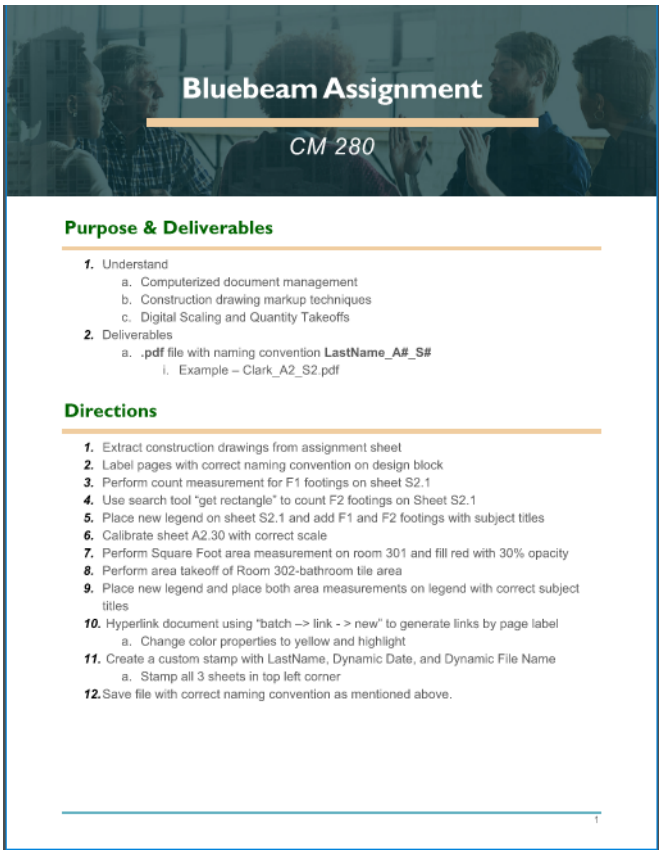
How to teach introductory Bluebeam assignment for Cal Poly Construction Management course 280 BIM. Have fun! This is a fun course, and the students love when you are engaged and eager to share some construction knowledge. If you decided to teach this section over person instead of the video provided, here is a step-by-step guide to teach the assignment. In further preparation, the Bluebeam Video can also serve as a guide to provide all tools necessary to lead students in the exercise.

Instructions:

1. Open Assignment in Bluebeam
   a. Download Assignment from Canvas and have them open in bluebeam
   b. If it opens in online browser, have them go to "downloads" then right click the file and "open with" and select bluebeam
2. Show how to navigate Bluebeam
   a. Scroll through pages, zoom, and pan
3. Extract Construction Documents
   a. Open the tab on left side of bluebeam labelled thumbnails that has 4 squares making 1 square
   b. Shift click all construction drawings
   c. Right click the documents and hit "extract pages"
   d. Name new file created "LastName_A#_SF"
4. Label construction documents with create page label too in the thumbnail section
   a. Select area near designer block in bottom right of sheet
5. Count Measurement of F1
   a. Select "tools" on top of screen and go to "Measure" and then select "Count Measurement"
   b. Click on all F1 footings
      1. Show how to add to count and remove from count by right clicking on the count measurement group
   c. Label F1 footings in subject in the properties tab when selected
   d. Change shape to preference and change opacity and size
6. Count Measurement of F2 Footing
   a. Go to search tab on left side of screen
   b. Select "get rectangle"
   c. Choose area of F2 and begin search

Figure 5. 3

Figure 5.3 shows the teaching step by step guide provided to faculty and staff who will be administering the curriculum. The steps are listed in simple form and encompass all steps to work through the software and material.



Bluebeam Assignment

CM 280

Purpose & Deliverables

1. Understand
    a. Computerized document management
    b. Construction drawing markup techniques
    c. Digital Scaling and Quantity Takeoffs
2. Deliverables
    a. **.pdf** file with naming convention **LastName_A#_S#**
        i. Example – Clark_A2_S2.pdf

Directions

1. Extract construction drawings from assignment sheet
2. Label pages with correct naming convention on design block
3. Perform count measurement for F1 footings on sheet S2.1
4. Use search tool "get rectangle" to count F2 footings on Sheet S2.1
5. Place new legend on sheet S2.1 and add F1 and F2 footings with subject titles
6. Calibrate sheet A2.30 with correct scale
7. Perform Square Foot area measurement on room 301 and fill red with 30% opacity
8. Perform area takeoff of Room 302-bathroom tile area
9. Place new legend and place both area measurements on legend with correct subject titles
10. Hyperlink document using "batch –> link - > new" to generate links by page label
    a. Change color properties to yellow and highlight
11. Create a custom stamp with LastName, Dynamic Date, and Dynamic File Name
    a. Stamp all 3 sheets in top left corner
12. Save file with correct naming convention as mentioned above.

1

Figure 5. 4

Figure 5.4 shows the assignment cover sheet and instructions. Providing the purpose of the assignment as well as giving brief instructions allows students to understand the assignment. On the following page of this document, the rubric lays out point grading system for faculty to assign points.

Figure 5. 5

Lastly, *Figure 5.5* shows Jacob Clark working on his senior project with a big smile.

Future Opportunities

Future opportunities include the creation of additional support material for other construction management software taught in the College of Architecture and Environmental Design. Originally intended for the course CM 280, BIM, this material can be used as a starting point and guide for development of video curriculum and teaching guides. Following the roll out of this curriculum, Bluebeam will continue to grow and incorporate latest ideas, tools, and methods that will shape the construction industry. Course material and instructions will have to be updated to reflect the ever-adapting market in the coming years.

Conclusion

Seeking to fulfill the demand of adaptable construction technology curriculum, this project further advanced the Cal Poly construction management department's available teaching resources for Bluebeam skills. With the creation of two distinct Bluebeam modules with basics and estimating, these modules allow students and faculty to engage in meaningful guided practices that reflect the growing trends of Bluebeam technology in the workforce. In addition to the tangible deliverables for the Cal Poly community, this project further developed my interest in curriculum creation, teaching, and higher education.